

Osteoporosis after spinal cord injury

S.-D. Jiang · L.-Y. Dai · L.-S. Jiang

Published online: 13 May 2006

© International Osteoporosis Foundation and National Osteoporosis Foundation 2006

Many of the reference numbers in the Tables 1, 2, 3 and 4 were incorrect. The correct tables are given here.

The online version of the original article can be found at: <http://dx.doi.org/10.1007/s00198-005-2028-8>

S.-D. Jiang · L.-Y. Dai (✉) · L.-S. Jiang
Department of Orthopedic Surgery, Xinhua Hospital
of the Shanghai Second Medical University,
1665 Kongjiang Road,
200092 Shanghai, China
e-mail: lydai@etang.com
Fax: +86-21-65795173

Table 1 Sublesional bone mineral density in spinal cord-injured patients

Author	Type of study	Duration after injury	Males	Females	Age	Skeletal site measured	BMD (Z-score, SD or % loss or reduction of BMD)
Bauman et al. [25]	Prospective	3–26 years	8		25–58 years	Lower limb	–35%
Biering et al. [11]	Prospective	9 days–53 months	8			Pelvis Femoral neck Distal femur Proximal tibia Femur diaphysis Tibia diaphysis	–29% –30~40% –48% –45% –25% –25%
Clasey et al. [23]	X-sectional	0.6–35.3 years	21	8	23–56 years	Lower extremity	–28.20%
Dauty et al. [10]	X-sectional	>1 years	31		18–60 years	Femoral neck Femoral trochanter Distal femur Proximal tibia	–30% –39% –70% –52%
de Bruin et al. [30]	Prospective	3.5 years	9	1	19–81 years	Distal tibial trabecular bone Distal tibial compact bone	–40% –11%
Demirel et al. [15]	X-sectional	2–30 months	32	9	19–49 years	Lower extremity	–2.19±3.5 SD
Finsen et al. [12]	X-sectional	7 months–33 years	19		15–64 years	Tibia distal diaphysis Tibia distal metaphysic	–26% –45%
Frey-Rindova et al. [13]	Prospective	12 months	27	3	19–59 years	Tibia trabecular bone Tibia cortical bone	–15% –7%
Garland et al. [31]	Prospective		6			Distal femur Proximal tibia Os calcis	–27% –32% –38%
Garland et al. [8]	X-sectional	2–8 years 3–30 years 9–44 years		6 16 9	20–30 years 31–50 years 53–77 years	Knee Hip Knee Hip Knee	–37.90% –17.50% –41.30% –25% –47%
Jones et al. [32]	X-sectional	7–372 months	20 (total)		17–52 years	Femur	–27%
Kiratli et al. [24]	X-sectional	0.1–51 years	239	7	27–78 years	Hip Femoral neck Femoral midshaft Distal femur	–37% –27% –25% –43%
Sabo et al. [4]	X-sectional	1–26 years	46		<50 years	Proximal femur	–24.50%
Uebelhart et al. [33]	Prospective	>6 months	6			Lower extremity	–6.40%

Table 1 (continued)

Author	Type of study	Duration after injury	Males	Females	Age	Skeletal site measured	BMD (Z-score, SD or % loss or reduction of BMD)
Warden et al. [6]	Prospective	1–6 months	15		19–40 years	Calcaneus Proximal tibia	-7.5±3.0% -5.3±4.2%
Zehnder et al. [34]	X-sectional		100		18–60 years		
		<1 year	16			Femoral neck	-0.03±0.25 SD
		<1 year	16			Tibia epiphysis	-0.34±0.22 SD
		1–9 years	38			Femoral neck	-1.65±0.17 SD
		1–9 years	38			Tibia epiphysis	-3.81±0.13 SD
		10–19 years	31			Femoral neck	-1.76±0.25 SD
		10–19 years	31			Tibia epiphysis	-4.00±0.21 SD
		20–29 years	13			Femoral neck	-1.76±0.28 SD
		20–29 years	13			Tibia epiphysis	-4.12±0.24 SD

Table 2 Superlesional bone mineral density in spinal cord-injured patients

Author	Type of study	Duration after injury	Males	Females	Age	Skeletal site measured	BMD (Z-score, SD or % loss or reduction of BMD)
Clasey et al. [23]	X-sectional	0.6–35.3 years	21	8	23–56 years	Upper extremity	+11.10%
Dauty et al. [10]	X-sectional	>1 year	20		18–60 years	Upper extremity	+6%
de Bruin et al. [30]	Prospective	3.5 years	9	1	19–81 years	Distal radius trabecular bone	-10~+14%
Demirel et al. [15]	X-sectional	2–30 months	32	9	19–49 years	Upper extremity	+0.09±0.15 SD
Finsen et al. [12]	X-sectional	7 months–33 years	19		15–64 years	Forearm distal diaphysis	-5%
Frey-Rindova et al. [13]	Prospective	12 months	27	2	19–59 years	Forearm distal metaphysis Radius trabecular bone Radius cortical bone Ulna trabecular bone Ulna cortical bone	-13% -8% 0% -4% -1%
Sabo et al. [4]	X-sectional	1–26 years	46		<50 years	Distal forearm	-6.10%
Zehnder et al. [34]	X-sectional		100		18–60 years		
		<1 year	16			Ultradistal radius	+0.02±0.24 SD
		<1 year	16			Radius shaft 1/3	+0.00±0.41 SD
		1–9 years	38			Ultradistal radius	+0.01±0.15 SD
		1–9 years	38			Radius shaft 1/3	+0.40±0.17 SD
		10–19 years	31			Ultradistal radius	+0.52±0.20 SD
		10–19 years	31			Rdius shaft 1/3	+0.97±0.20 SD
		20–29 years	13			Ultradistal radius	+0.44±0.32 SD
		20–29 years	13			Radius shaft 1/3	+0.27±0.31 SD

Table 3 Bone mineral density of lumbar spine in spinal cord-injured patients

Author	Type of study	Duration after injury	Males	Females	Age	BMD (Z-score, SD or % loss or reduction of BMD)
Clasey et al. [23]	X-sectional	0.6–35.3 years	21	8	23–56 years	2%
Dauty et al. [10]	X-sectional	>1 year	31		18–60 years	–11%
Garland et al. [8]	X-sectional	2–8 years		6	20–30 years	2%
		3–30 years		16	31–50 years	8.10%
		9–44 years		9	53–77 years	14.80%
Liu et al. [39]	X-sectional		64		20–98 years	–2.0±1.2 SD
Sabo et al. [4]	X-sectional	1–26 years	46		<50 years	–3.80%
Zehnder et al. [34]	X-sectional		100		18–60 years	
		<1 year	16			–0.43±0.19 SD
		1–9 years	38			+0.11±0.15 SD
		10–19 years	31			+1.09±0.23 SD
		20–29 years	13			+1.00±0.42 SD

Table 4 Fracture incidence in spinal cord-injury patients

Author	Type of study	Duration after injury	Males	Females	Age	Fracture incidence
Comarr et al. [48]	X-sectional		1,363 (total)			11%
Frisbie et al. [50]	X-sectional	21.1±12.1 years	120		20–79 years	33%
Ingram et al. [47]	X-sectional	>1 years	526 (total)		13–70 years	5%
Lazo et al. [5]	X-sectional	1.1–43.1 years	49		27–83 years	34%
Ragnarsson et al. [46]	X-sectional	9 years (mean)	578 (total)		4–71 years	4%
Vestergaard et al. [49]	X-sectional		309	129	17–80 years	2%/year
Zehnder et al. [34]	X-sectional		100		18–60 years	
		<1 year	16			1%/year
		1–9 years	38			1.3%/year
		10–19 years	31			3.4%/year
		20–29 years	13			4.6%/year